

## Section 6.4- Error and Power

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	<u>truth</u>	
	$H_0$ true	$H_0$ false
Reject $H_0$	Error Type I error more serious $\alpha$	correct power - given $\uparrow$
Fail to reject $H_0$	correct	Error Type II error $\downarrow$ $\beta = 1 - \text{power}$

Type I error = Reject  $H_0$ , when  $H_0$  is true

\* more serious

Ex: religion business

$$P(\text{Type I error}) = \alpha = 0.01, 0.05, 0.10$$

power = reject  $H_0$  when  $H_0$  is false

another  $\mu$   
that is true

$\mu_A$  = alternative

~~$H_0: \mu = 10$~~

$H_a: \mu > 10$

$\mu_A = 13$

Formula:

$$\text{power} = 1 - \beta$$

$$\beta = 1 - \text{power}$$

often:

$$\beta > \alpha$$

- in 6.4 - ignore
- power  $> 80\%$

### Example #1:

a)  $H_0: \mu = 8$   
 $H_a: \mu > 8$

$\mu_A = 8.15$

$\sigma = 0.16$

$n = 25$

$\alpha = 0.05$

b) yes, power  $> 80\%$

c)  $\alpha = 0.05$

d)  $\beta = 1 - \text{power}$   
 $1 - 0.845$

$\beta = 0.155$

e)  $\uparrow n$   
 $\uparrow \alpha$

p-value: 0.07

## Increasing Power:

- 1) Increase  $n$ 
  - more data  $\Rightarrow$  more info about  $\mu$   
& whether claim has changed.
- 2) Increase  $\alpha$ 
  - bigger chance of rejecting  $H_0$
- 3) Decrease  $\sigma$ 
  - \* can't do
- 4) Consider an alternative ( $\mu_a$ )  
further from  $\mu$ .

Ex2

a) X

b) no, power < 80%

c)  $\alpha = 0.01$

d)  $\beta = 0.342$

> \*incontext

e) decrease

f) increase

g) decrease

h) increase